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Finding the Appropriate Forage Value for Analyzing the Feasibility of Public Range Improvements

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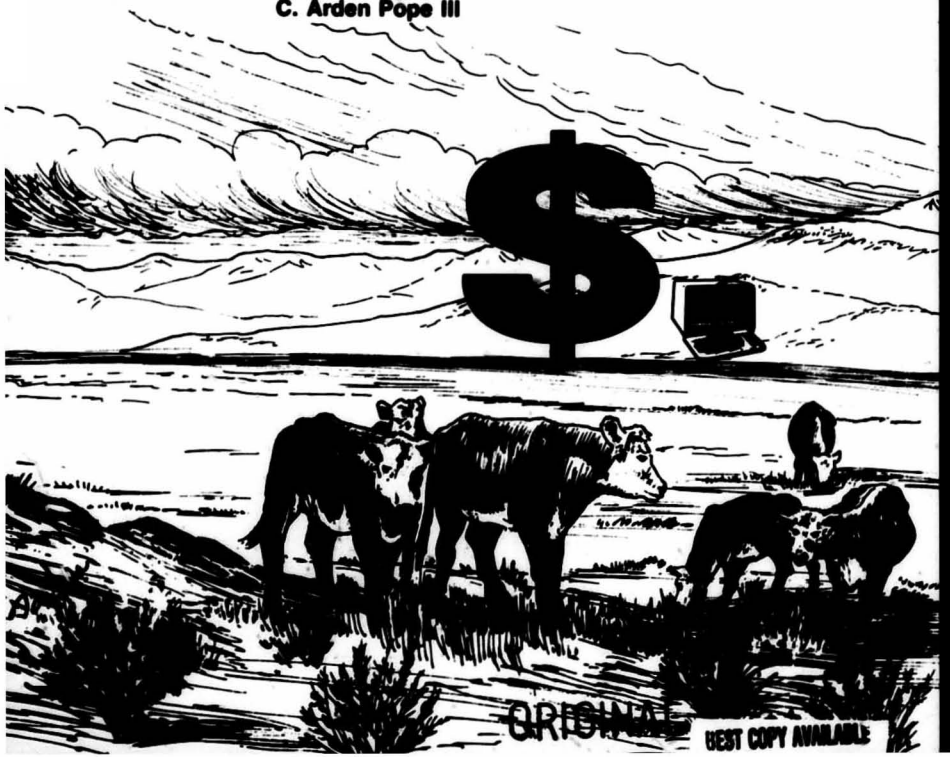

RESEARCH SUMMARY

To complete economic analysis of range improvements completed on the Oak Creek Management area of central Utah, we needed an estimate of the value of forage. A review of the literature revealed several methods of estimating forage values. These methods yielded eight estimates of public rangeland forage ranging from $1.23 to $30 per animal unit month (AUM). Six of the estimates were based on actual market transactions or current administered prices and were the most reflective of actual economic processes. The best estimates of value were those for leasing similar rangeland in the immediate area.

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INTRODUCTION

The concern about finding the value of range forage on public lands has been with us for many years. The Federal Government has long been concerned with determination of grazing fees that represent or are based on fair market values (Sutton 1983; Andrus and Berglund 1977). The search for the most appropriate value estimate for public land grazing has led to many studies throughout the years using different approaches and resulting in a multitude of recommendations (Clawson 1938; Vass 1940; Roberts 1963, 1967; Nielsen 1972; Bartlett 1983). The results of these evaluation studies have been tempered by the political process involved in grazing fee determination and have resulted in an administrative fee based largely on political compromises that generally underestimate the value of public land grazing benefits.

Using an appropriate level of forage value or benefit is crucial in economic analysis because use of unsupported and unrealistic values casts doubt on the validity of the conclusions. Currently, there is considerable variation in the values used for planning and analysis purposes even within a single agency (USDA 1982). Brown (1984) points out there are numerous assumptions to any method of determining values, and "the value" probably does not exist. Viewing forage from a static value concept differs from a standard economic theory where values are continually fluctuating around a dynamic equilibrium due to supply and demand forces (Watson and Holman 1977).

Economic analysis of range improvement practices and comparison of alternative uses for rangeland require reasonable and appropriate estimates of the value of livestock grazing benefits. These estimates, however, differ greatly depending upon the methodology used and the critical assumptions made. This paper will briefly discuss the most common approaches to valuing livestock grazing on public lands. The variability of their results is demonstrated in a case study based on the Oak Creek Range Evaluation Project in central Utah (Pope and Wagstaff 1987).

EVALUATION METHODS

Currently, the forage value that is used to establish the grazing fees charged by the Bureau of Land Management (BLM) and Forest Service is based on a predetermined formula. This formula consists of a base value of $1.23 per animal unit month (AUM) and is adjusted annually based upon charges in private grazing leases, value of beef cattle, and the cost of production. The base value of $1.23 is based on a market rental survey of leases of forage from 1964 to 1968. In 1985, grazing fees were set at $1.35, and based on this formula, grazing fees in 1986 would be about $1.01. A recent executive order by President Reagan maintains the current fee formula but sets a floor of $1.35 per AUM. The Federal lands grazing fee has not been set at a level reflecting full market value in the past, nor does it appear this will happen in the near future. The practice of underpricing has caused the grazing permits to take on value through capitalization of the surplus.

Budgeting Procedures

Several methods of ranch firm or enterprise budgeting can be used to estimate the value of forage. These methods range from hand-driven itemizations of firm expenses and income to highly complex computerized linear programming models. Recent publications by the Economic Research Service show the results of applying linear programming in Western States (Gee 1981, 1983). Values obtained from linear programming studies where producer estimates of values are grouped are consistently, and often considerably, higher than the results of other methods. This probably reflects the results of using small samples of producers and the fact that other methods underestimate the full value of forage in the production process.

The budgeting approach to estimating value has appeal because of the straightforward procedure, but it rests on several assumptions that need to be understood. The budget approach depends upon the correct allocation of income and expenses to many variables used in a livestock firm, and without large amounts of expense and accounting data it is questionable (Bartlett 1983). During times of rapid factor price change, budgeting may be seriously deficient as an estimator of value.

Major criticism and questioning of the validity has come from many authors. They basically argue that it is highly questionable to allocate residual income to a single factor such as grazing forage (Gee 1983). Indeed, to arbitrarily price management and unpaid family labor at some prescribed level and then allocate remaining value to another factor seems highly questionable.

In practice, budgeting can be used to give some rapid first approximations of values and as a check on other methods. Because budgets require considerable data, many analysts rely on secondary sources for many items and supplement this with primary data. This tends to decrease accuracy of results.

Substitute Feed Method

Economic theory holds that if two factors are perfect substitutes for each other in a production process and the value of one is known, the value of the other in the process is set at the same level (Watson and Holman 1977). There have been attempts to value range forage by this approach (Roberts 1967; Bartlett 1983). In these studies, relatively high values were derived due to the strict assumptions of the model.

The substitute feed approach rests upon determining a price for the substitute, which is commonly hay because market prices are recorded. This price then must be adjusted for quality differences, location, and other costs incurred in using the substitute, and considerable judgment is required as well as some assumptions concerning the practicality and feasibility of such a practice (Wagstaff 1983).

Market Comparisons

Several studies conclude that there is an established market for public range forage and that the value of forage can be determined through market analysis (Gardner 1962; Bartlett and others 1981; Bartlett 1983).

Estimates of value are made by comparing the item in question to the value or price for which similar items have been exchanged. The larger the number of market transactions and the more homogeneous the item, the more reliable estimates will be. Range forage is location specific: livestock must be moved to where the forage is. Also, certain ranges have climatic attributes that allow use only during a specific season.

If a range forage market does exist and public land forage is traded in that market as argued by Nielsen and Wennergren (1970), Bartlett (1983), Gardner (1962), and Roberts (1967), then exchange price could be used to estimate value. It is true that adjustments must be made and care exercised to compare transactions that are as similar as possible to the subject area.

The literature details two approaches to market comparisons. One approach uses sales of forage itself through rents or leases with required adjustments. The other approach uses the capitalized value of Federal grazing permit transfers between individuals.

Federal grazing permits have value due to the fee being set at a level below the value of the forage to livestock owners. These permits are bought and sold even though they are not recognized as a vested right by the issuing agencies (Andrus and Berglund 1977; USDA and USDI 1985). The annualized value of this permit plus the fee and nonfee costs will yield an estimate of the willingness to pay value of the forage.

Case Exampie

In 1978, the Oak Creek Range Management Project was established under an accelerated range management program spearheaded by the Forest Service (Pope and Wagstaff 1987). The project included 117,200 acres of the Fillmore District of Fishlake National Forest in central Utah. Economic analyses were to be completed for various practices and improvements. An integral part of these analyses was a reasonable estimate of the value of public rangeland forage for livestock grazing.

Eight estimates of AUM values on the Oak Creek Project Area are provided in table 1. These estimates have resulted from different studies using alternative methods.

Table 1—Animal unit month (AUM) value for the Oak Creek Range Management Area

Method	AUM value
1. Grazing fee from current formula (1985)[1]	$ 1.35
2. Budgeting/linear programming (1981)[2]	9.46
3. Substitute feed (hay)	30.00
4. Substitute feed (irrigated pasture-hay meadow)	15.00
5. Market comparison (private rangeland lease rate, 1983)[1]	5.50
6. Market comparison (private rangeland lease rate, adjusted for cost and advance payment 1983)[1]	4.68
7. Market comparison (annualized average permit value plus grazing fee)[3]	5.93
8. Market comparison (competitive bid on comparable State land, 1982-1985 average)	6.23

[1]See USDA and USDI "1985 Grazing Fee Review and Evaluation."
[2]See Gee 1981.
[3]Average permit value from table 2. Annualization rate equals 8 percent (57.29 × 0.08 ÷ 1.35).

Estimate 1 is the grazing fee for 1985 established by the current public rangeland grazing fee formula. Because the indices upon which this fee is determined have not proven highly reliable, and political considerations have held the fee at levels different from those shown by the indexing, the fee as an estimate of full forage value for livestock production is unreliable. This estimate of value is an average value and would be low as an estimate of additional forage value.

Estimate 2 comes from budget/linear programming. The figure is from an Economic Research Service (ERS) study using linear programming to estimate forage value (Gee 1981). The AUM value of $9.46 is basically the estimated residual income to the forage as determined by this approach. This value may reflect the higher end of values because a panel of producers generated the coefficient for the budgets, and they probably reflect a higher than average efficiency in livestock production.

Estimates 3 and 4 are based upon the substitute feed approach. This approach is highly questionable and results

in crude estimates. These estimates exaggerate the value of forage due to the shortage of substitute feed in the form of hay and the high prices of hay due to strong demand from the California dairy industry and export to Japan. Hay prices in 1983 and 1984 were $76 and $73 per ton, so the use of hay to produce feeder calves is clearly not reasonable because this would be roughly $30 per AUM, and other feed sources would be cheaper.

Irrigated pasture is limited and rents for about $15 per AUM. Also, comparability is a problem in using either hay or irrigated pasture to value range forage because animal performance, services included, and other factors differ greatly from public rangeland.

Estimates 5 through 8 are estimates of AUM values that resulted from actual market comparisons. They are also measures of the value for substitute forage. Estimates 5 and 6 are based on private rangeland lease rates as reported in the 1985 Grazing Fee Review and Evaluation (USDA and USDI 1985). Estimate 6 is adjusted for additional costs associated with grazing on public land and a prepayment adjustment.

Estimates 7 and 8 are based on data more specific to the Oak Creek Project Area. To obtain estimate 7, information was obtained on all transfers of grazing permits on the Fillmore District that occurred from 1978 through June 1985. These were transfers of permits on National Forest lands within or directly surrounding the project area. In this period, 38 transfers occurred. During 1985, buyers of these permits were contacted to establish the actual amount paid for the permits alone. Of the 38 transfers, there were 24 bonafide transactions in which the permits were actually bought and sold and the price paid for the permits could be verified. All 24 transactions involved only the permit and cattle. On nine of the transfers the price of the permit could not be verified because the whole ranch was sold with no reliable breakdown of price cost of permits, the buyer couldn't remember or didn't know the breakdown between cows and permits, or the transaction occurred between family members at a "less than arms length" transaction. Five of the buyers could not be contacted. All of the ranchers contacted willingly verified the transactions and provided the price paid for permits.

The price paid for permits on an AUM basis ranged from $29.70 to $95.45 with an average of $57.29. The average prices paid for permits on an AUM basis for 1978 through 1985 are given in table 2. These compare closely with 1983 public permit values in Utah as observed in the "1985 Grazing Fee Review and Evaluation" (USDA and USDI 1985). The value was annualized assuming a perpetual interest in the permit, using an 8 percent interest rate and added to the annual grazing fee.

To obtain estimate 8, prices for grazing on State of Utah Division of Wildlife Resources land were obtained. State lands, similar to those in the project area that are included in an open bidding process, are used to calculate average bid prices for each year. A large tract of land managed by the State of Utah lies adjacent to the southeast of the development area. It is similar in topography and vegetation, is used during the same season, and

Table 2—Summary of permit transfers, Fillmore Ranger District, Fishlake National Forest, 1978 to 1985

Record number	Year	Number of cattle	AUM's	$/AUM
1	1985	8	28	38.57
2	1982	30	110	88.64
3	1978	22	77	42.86
4	1981	15	52.5	38.57
5	1984	17	40.23	42.25
6	1984	17	40.23	42.25
7	1978	241	1,164.83	41.38
8	1980	48	152	55.26
9	1979	49	155.18	55.26
10	1982	48	232	62.07
11	1980	50	183.33	47.74
12	1984	17	57.23	29.70
13	1983	87	304.5	57.14
14	1982	36	174	62.07
15	1982	40	193.33	62.07
16	1981	34	164.33	82.76
17	1985	10	48.33	62.07
18	1978	20	97.67	62.07
19	1979	15	50.5	29.70
20	1979	72	264	75.00
21	1983	52	190.67	95.45
22	1983	20	73.33	[illegible]
23	1984	20	73.33	[illegible]
24	1983	34	164.33	51.[illegible]
Totals		1,002	4,090.85	57.29

leasees have essentially the same responsibility for livestock care and management as on adjoining Federal lands. Its lease rate is the average bid rate for all State Division of Wildlife Resources grazing land leases for the previous year. A summary of average lease rates or bids for 8 years is shown in table 3.

Table 3—Grazing lease information for lands administered by Utah Division of Wildlife Resources, 1978 to 1985

Year	AUM's	Average lease or bid	Change from previous year
		Dollars	*Percent*
1978	3,846	5.28	—
1979	4,367	4.75	-10
1980	3,902	4.27	-10
1981	3,129	5.44	+27
1982	3,864	6.23	+14.5
1983	3,841	5.71	-8
1984	4,015	6.57	+15
1985	7,336	6.41	-2.5
Average, 1983 to 1985:		6.23	

CONCLUSION

Evidently, estimates of forage value differ significantly depending upon the methodology and assumptions used. However, the most realistic value estimate seems to be determined through market comparisons of the most likely substitute forage. Such an estimate is based on what producers actually pay, not what they hypothetically could or should pay.

This study suggests that a reasonable estimate of the market value of public range forage in the Oak Creek area falls within the $4.50 to $6.50 range. Economics analysis of range improvements should consider the sensitivity of the analysis results to charges in forage values.

The feasibility analysis of public range improvements will be most accurate if forage values derived from market transactions are used or they are most reflective of actual conditions. Rough estimates from other methods could be used for a quick estimate, and then a sensitivity analysis can be used to show how much effort is justified in getting a better estimate. The value of the fee and the linear programming studies could be used as high and low brackets for first estimates of forage value.

In the case example, the selection of a forage value, with the exception of the value of hay as a substitute feed, confirms this conclusion. The project costs per additional AUM of forage produced were quite high (see Pope and Wagstaff 1987).

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Eight methods for estimating the value of an animal unit month of public rangeland grazing generated estimates applicable to the Oak Creek area of central Utah. Of the eight estimates, six bracketed the range of acceptable estimates. The price paid for leasing similar rangeland was considered the most accurate estimate.

KEYWORDS: forage value, AUM value, public grazing value

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